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NORTH AMERICA AND EUROPE: A GEOGRAPHICAL COMPARISON¹

NOTHING could surpass my curiosity when I landed for the first time in North America, a new world, separated from the old one by a great ocean. As a geologist, I knew that similar rocks formed the land and that similar surface features would occur, but as a geographer, I knew too that the vegetation of North America differs from that of Europe and that there are only a few species common to both sides of the water. What will be the impression of the landscape—will it be European or a different type? But when I put my foot on the land near Quebec I became aware that the general features of the landscape and the surroundings of man were nearly the same there as in Europe, and only a closer inspection convinced me that I was amid a new flora. Indeed, I had the feeling of being not in a latitude south of Vienna, whence I had just come, but rather of being in the same surroundings as at Stockholm—twelve degrees of latitude farther north.

There are, indeed, very strong similarities between North America and Europe. A superficial glance at our maps will reveal similar features. Europe is only a peninsula of Asia, and the peninsular character determines all features of this continent. North America may be compared with the whole of Eurasia, and its eastern part shows a similar peninsular articulation as

¹ Inaugural lecture by the Kaiser Wilhelm Professor, delivered at Columbia University on November 3, 1908.

Europe. That peninsular region stretches east of the Mississippi Valley, the region of the Great Lakes and Hudson Bay, and there are doubtless more pronounced geographical differences between this articulated part and the continental part of North America than between peninsular North America and peninsular Eurasia—that is, Europe.

Europe gets its characteristic features from some invasions of the sea. Northeast of Scandinavia a part of the Arctic Sea penetrates into the land and branches here as the White Sea. Farther south the very edge of the continent seems to be inundated, so that Great Britain and Ireland are isolated, and from the German Sea the Baltic Sea extends far into the interior of the continent. Still farther south is the Mediterranean Sea, which separates Europe from Africa. All these features seem to be repeated on the west side of the Atlantic. Here we see the Arctic water penetrating far to the south, forming Hudson Bay. Farther south the eastern corner of North America is inundated; Newfoundland is isolated, like Great Britain; and the Gulf of St. Lawrence extends far into the interior of the country, getting its waters from that remarkable group of lakes which in many respects resemble the Baltic Sea. This resemblance was far stronger at the end of the last geological epoch, when a vast body of fresh water existed instead of the Baltic Sea which poured through the river valley of the Sund between Denmark and Sweden into the basin of the German Sea. The resemblance of the Gulf of Mexico to the Mediterranean is such a striking one that Alexander von Humboldt called it a mediterranean sea; and, indeed, it divides America into two separate continents—North America and South America.

These similarities between Europe and peninsular North America are not merely superficial ones. In a very remarkable

way, these two sides of the Atlantic repeat the same structural features; there is an astonishing symmetry, as Eduard Suess has shown so clearly. The northeast of Canada and Labrador on one side, and Scandinavia with Finland, the region of Feno-Scandia, on the other, are both composed of the oldest rocks we know of. These have a very complicated structure, being intruded with many eruptive rocks, and in a secondary way only, the surface features of the above regions are dependent on their structure. Both regions had already been leveled down before Cambrian times, and they sink gently down under a cover of horizontal Paleozoic strata. Both were called by Suess shields. The resemblance between these shields is the more conspicuous because both were covered during the last ice age by a glaciation which molded their surface in a similar way. In Sweden and Finland we find the same rounded glaciated surface, the same numerous lakes, as in Canada, both regions of the earth claiming to be the land of the many thousand lakes. At the border of both regions the horizontal Paleozoic strata begin with an escarpment which is pronouncedly developed south of Lake Erie and south of the Gulf of Finland, called here the “glint,” and we shall keep this expression to designate similar escarpments. These strata continue far into the interior of Eurasia, and they do the same in North America.

In the same way that we compare the Canadian Shield with the Scandinavian Shield we can compare the region east of the Mississippi Valley with the interior of Russia—both parts of the world have never been compressed by mountain-folding since Paleozoic time. Only a few faults occur here, and the whole geological history consists in slight up-and-down warps which brought both regions several times under the surface of the transgressing ocean. Also, here the younger geological history

has augmented the similarity. Huge morainic accumulations south of the Great Lake region of North America form the watershed between the Mississippi and St. Lawrence Rivers, and similar morainic deposits form the watershed between the Baltic and the Black Seas. Thick loess deposits are found in front of these morainic deposits in the Mississippi basin as well as in the interior of Russia. The loess gives rich harvests to the corn regions of Iowa, Nebraska, Kansas, Missouri and Illinois, the counterparts of which are found in Wolhynia and the region of the Tshernosiom of the south central governments of Russia.

East of the Mississippi basin the old Paleozoic strata are folded and form the Appalachian belt, and similarly, west of the plains of Russia the Paleozoic strata of Europe are folded, forming a set of mountains which we can trace from the south of Russia to the west coast of Europe. In the central part of Germany these mountains constitute the belt of the German upland, and here it was that their geological history was first understood. The folding of the strata occurred near the end of the Paleozoic era and ceased before the end of the Permian epoch. Then they were base-leveled and covered totally or in part by Mesozoic deposits, after which mountains arose by faulting and warping, forming here and there true tilted blocks. The elevated parts lost their Mesozoic covering and the folded old strata again became visible.

This history is nearly the same as that of the Appalachian region. Here also the folding of the strata ended towards the close of the Paleozoic era and the folded mountains were leveled down. Then they became partly or totally covered with Mesozoic deposits, and the mountains of to-day were formed by upheaval. In North America, indeed, they form a more

connected zone, while in Europe they are mostly groups of mountains, separated from each other by basins of Mesozoic or younger strata. During the epoch of folding, the Appalachian region and the zone of the Hercynian Mountains of Europe may have formed mountains of the height of the Alps of to-day. I called them, therefore, the Paleozoic Alps of middle Germany, but to-day these regions have only lower altitudes; they do not surpass, as the Appalachian region does, 2,000 meters. The striking features of these base-leveled Paleozoic mountains consist of the fact that on both sides of the Atlantic the belt of their ancient foot-hills contains coal measures. As the Allegheny region in North America, so the mountains of South Wales, the northern boundary of the Ardennes and of the neighboring Rhenish mountains contain the richest coal measures. And as we find west of the Allegheny region some coal measures, so we find some extensive coal layers north of the belt of the Hercynian Mountains in England and Scotland, in upper Siberia, in the east of Germany, and in some places in the interior of Russia. The industrial evolution of eastern United States, of England and Wales, or Belgium and the German empire, is based on the same fact, that a rich vegetation once covered the foot-hill region of the mountains up-turned towards the end of the Paleozoic era.

It is very interesting to see how the Appalachian region ends at Newfoundland, forming the projecting eastern corner of North America, and just opposite in south Ireland, in South Wales, in Cornwall and in Brittany the belt of the old Hercynian Mountains of Europe begins. One seems to be the continuation of the other, and such an excellent geologist as Marcel Bertrand maintained that we have here to deal with the two ends of one very extensive belt of mountains which extended through

the North Atlantic Ocean. But we must not forget that the missing link between both ends of these supposed mountain chains is longer than their known extent.

There are also similar structural features between the Mediterranean Sea and the Gulf of Mexico and its surroundings. Both seas consist of a set of very deep basins, separated by higher regions which reach more or less above the sea-level, and the Mesozoic strata in their vicinity are folded, but there is one very marked geographical difference between their surroundings. On the north side of the Mediterranean Sea extends a nearly uninterrupted belt of mountains which contains the highest elevation of Europe, while there is no high mountain range at all at the north of the Gulf of Mexico. The high elevations on the north side of the Mediterranean sharply divide western Europe into an Atlantic and a Mediterranean part, while all the natural regions of eastern North America continue uninterrupted to the Gulf. The high mountain belt on the north side of the Mediterranean Sea prevents the rivers from entering the Mediterranean; it pushes aside the Danube and only the east annex of the Mediterranean—the Black Sea—receives in the Danube, the Dneiper and the Don, important rivers which can be compared with the branches of the Mississippi River. But the river of Europe which as to size and ramifications bears most resemblance to the Mississippi—the Volga—empties its waters into the Caspian Lake. This, the largest lake on the earth, can be regarded, however, as an isolated basin of the Mediterranean. During the Ice Age its waters stood probably so high that they could overflow through the Manytsh Valley, north of the Caucasus, into the Black Sea so that the Volga got an outlet into the open sea. Therefore, during the Ice Age the arrangement of the eastern European rivers corresponded more nearly

with that of the Mississippi and its branches, and this similarity would even exist if we assume that then the Black Sea itself was an inland sea, for such an inland sea could pour its waters through the Bosphorus into the Mediterranean. The Bosphorus, indeed, bears many features of a river valley, and it may have been at one time the outlet of all European rivers from the Danube to the Volga, of a body of water as large as that of the Mississippi. But while the large American river enters the sea through a large delta deposited by it, the European Mississippi passed through narrows just above its mouth, as the Hudson does; it had to force its way through the mountain belt north of the Mediterranean.

The absence of such a mountain belt in North America causes an important difference in the climate of the peninsular regions on both sides of the Atlantic. The climate of Europe is hardly at all affected by the Mediterranean, whereas the absence of a mountain belt north of the Gulf of Mexico allows the winds to sweep around the west end of that zone of high atmospheric pressure which extends across the Atlantic. Thus we have southwestern winds in North America, and as the southwestern winds of Europe bring the moisture and the warmth of the Gulf Stream drifts over large areas of Europe, so also the moisture and warmth of the Gulf of Mexico is brought into the southeastern part of North America. The effect of the cooling influences which the interior of a continent can exert by its high pressure and cold on the mean latitudes of its east coast, is counteracted to a large extent, and peninsular North America enjoys as well, but not as much, as the European peninsula of Eurasia, a peninsular climate.

But the peninsular climate of both sides of the Atlantic is not the same. It is most strongly developed in peninsular North

America in the south, but in Europe, in the north. The southwest winds blow in peninsular North America mostly during the summer; in Europe, however, during the winter, just at the time when cold northwest winds bring cold waves to the United States, and similar temperature is met with in very different latitudes of both sides of the Atlantic. Indeed, the climate on both sides of an ocean can not be the same; there must be differences between the east and west shores of the continents. Europe has the true climate of the west coast of a continent. The climate of this side of the Atlantic has its exact counterpart in North America in British Columbia, and the Mediterranean climate reoccurs in all of its characteristic features farther south in California. The high elevations of the mountains of British Columbia and of the Sierra Nevada, however, hinder the extension of these climatic conditions into the interior of the continent, while the open west of Europe allows the western winds to carry their moisture very far into the interior, and the long extent of the Mediterranean Sea is accompanied by a climate like that of California from the south of Spain over the south of Italy and Greece as far as Asia Minor. Thus one very large climatic province of very uniform character extends between the Atlantic Ocean and those semi-arid regions in which the higher civilization of the Orient in ancient times was born. And this climatic province possesses many features similar to those of semi-arid regions. This fact is of the greatest importance for the evolution of civilization in Europe.

We can trace back the European population very far. Man witnessed in Europe that set of climatic changes which characterize the great ice age, but while it is still open to discussion whether the present population of Europe had its origin in that

very old one or whether it came from Asia, there can be no doubt that the European civilization has its root in the Orient. Here in Mesopotamia and in Egypt an early civilization arose under arid and semi-arid conditions, based on irrigation; this civilization was brought by early navigators over the whole basin of the Mediterranean and it found congenial conditions everywhere along the shores. In America such an evolution was impossible. Indeed, an original civilization has grown up here under semi-arid conditions, and it was based, too, on irrigation. This is not surprising. Irrigation is the easiest way to introduce agriculture. It is only necessary to distribute water and crops become possible. There is not necessary the very difficult work of clearing the forests. But a certain political organization is necessary which begins at the moment when the rules are established according to which the water is distributed.

The conditions under which the early civilization on the plateau of Mexico was developed are, indeed, in many respects similar to those of the Orient. That civilization, however, was not only far more feeble than that of the Orient, but it could not extend in the same way. The American Mediterranean is far larger than that between Europe and Africa, and early navigation did not find here the same landmarks which allowed the Phœnicians and Greeks to sail so far, but above all the shores of that sea were not as inviting to settlers as those of Greece, Italy, Spain or northern Africa. They are covered for a wide extent by dense, tropical, nearly impenetrable forests, and a belt of those virgin forests hindered the Mexicans from extending their civilization down to the Gulf of Mexico. At no time has this sea played a rôle similar to the Mediterranean; a Roman empire could never grow up east of the cradle of the American civilization

along the shores of the sea between North and South America.

The Roman empire was a true Mediterranean state, but it pushed forward its frontiers as well to the deserts of the Orient as to the woodlands in the north. Woodlands only rarely favor the evolution of a primitive civilization. Agriculture needs here more than irrigation; the forests must be cleared. This is a very hard work which goes on very slowly, and it must be followed by a continual struggle against the constantly new-growing forests. Here the family work has the greatest success and political organization only will very likely be formed. Indeed, the Romans regarded the wood-folk in the north as barbarians, though these had a civilization of their own which was of not inconsiderable height. They had already submitted extensive ground to agriculture; they already manufactured iron, and they were settled in villages and towns. But there can be no doubt that the Romans brought them more of the high civilization of the Orient than had reached them through the commerce of the Phœnicians and Greeks. By this, the Romans aided their neighbors in the north until finally the latter left their forests and conquered the south.

This political movement had as a starting-point central Europe. This is the center around which the other parts of Europe are arranged in such a way that they can be directly reached, and while most of these other parts are more or less separated from one another, lying isolated like Great Britain, or stretching into neighboring seas like Scandinavia, or Spain, or Italy, or the Balkan peninsula, they all are either connected with or are near to central Europe. Therefore, the relations between those members of Europe and the center were always active. Open to all sides, this center has suffered by its neighbors when its population was feeble and without

force; or, on the other hand, when its inhabitants are strong, they influenced all Europe. More than once central Europe acted as the heart of the European body and drove fresh blood into the members.

When the forest-folk of central Europe had gained from the Romans knowledge of the favored regions of the Mediterranean basin rich in all kinds of fruit, they began to move towards the south; they laid in ruins the Roman empire and founded new kingdoms, but they could keep their nationality only where they appeared in great numbers. They were absorbed by the peoples of southern Europe, and the German ground extended only in the southwest, along the Rhine, and in England. England still bears the name of the German tribe—the Angles—who, together with the Saxons, conquered that extreme part of the old Roman empire, and in the whole of Europe we find witnesses of former German immigration. In the south of Spain, the name of Andalusia reminds us of the German tribe of the Vandals who came from the Baltic Sea. In upper Italy, Lombardy conserves the name of those long-bearded Germans who settled there, and in the regions north of Milan you see more blond people with blue eyes than in many parts of the German empire. France received her name from the German Franks who extended their empire there.

The emigration of the German wood-folk seems not to have been caused by the pressure of other peoples. There seems to have been awakened a yearning among the German tribes to occupy better countries than their own. It seems to have been a similar longing to migrate and to settle new countries as that which prevailed in the eastern states of North America for more than one hundred years and which caused that enormous extent of the Anglo-Saxon race over the whole continent of North America. As in New England, the woodlands which were

left by their agricultural population were resettled by new emigrants—the old Puritan ground being entered by Roman Catholic Irish and Italians and French Canadians and Russian Jews—so also in Germany the areas were resettled which had been left by their emigrating inhabitants, especially the eastern part. But the emigration had been more complete than in eastern New England, and the new settlers found a vacant country in which they could introduce their own language. A reaction, however, set in, and since the times of Charlemagne the Germans have been taking back their old land from a population whose descendants are to-day, in North America, classed as undesirable immigrants.

While this was beginning, the northern neighbors of the Germans, the Scandinavians, were seized with a similar longing to migrate that the Germans had experienced several hundred years ago, but while the Germans migrated on the land, the Scandinavians went on the sea. Scandinavian tribes crossed the Baltic Sea and crossed into the forests of northern Russia, where they founded the Russian empire, the name of which points back to the times when the Scandinavian conquerors used their slavish subjects as "rowmen." Scandinavian pirates devastated the coast of northern Germany, of England, Scotland and France, where they settled, forming Normandy. They sailed into the Mediterranean Sea and at Constantinople met with countrymen going through Russia. Others went into the northern seas, discovering the Fäer Oer, Iceland and Greenland. They even came over to North America, but this discovery was accompanied by a large number of men prepared to settle, and it remained unknown to the greater part of Europe. Even Greenland was totally forgotten, and its few Scandinavian inhabitants expired when they came into contact with the Eskimo population. Thus

the outburst of Scandinavian peoples, like the older outbursts of German peoples, resulted in but a slight expansion of Scandinavian ground. The Norman settlers along the Mediterranean and the shores of the Channel became intermixed with their neighbors, and when the Normans conquered England they brought with them French language and French customs.

In Germany, after the time of martial expansion of the people was over, more settled conditions ensued, and the vast forest-clad mountain regions which had heretofore been only visited by hunters were now cleared and a kind of interior colonization took place in the central part of the empire. The terminations "reute" and "schwende" of names of German villages indicate that the clearing of their forests was either by felling or burning the tree, and so famous became the Germans as clearers of woodland that they were called into the mountains of Bohemia, Silesia and Hungary, where peaceful colonization took place. German colonies, following the extension of German sea traffic, were founded along the shores of the Baltic Sea and even on the west coast of Norway, where the city of Bergen is a German colony; even centuries after, when the Russian empire had been extended from the Baltic to the Black Sea and to the Pacific, Germans were invited to settle in order to cultivate the country. These German colonies, which spread over all Russia, are found even in the steppe countries east of the Volga and of the Crimea.

Those waves of Asiatic steppe roughriders which now and then spread out over the low ground of eastern Europe, were always broken when they reached German ground. Here the Hungarians were defeated. The Mongolian wave which had terminated the early Russian empire met with the same fate when it came to eastern Germany, as did the wave of Turks which

so easily rushed over Hungary. From the walls of Vienna imperial German armies drove back the Turks into those frontiers of Turkey, which lasted until the end of the nineteenth century, and German settlers founded a new culture in Hungary.

Thus the influence of early German conquest and later German peaceful colonization is felt nearly over the whole of Europe. The earlier conquest formed the nobility of France and Italy, where many noble families still conserve more or less corrupt German family names, and German names were long in use for noblemen in medieval times. German colonists developed the agricultural resources of the southeast and east of Europe and German merchants extended their commerce on the coast of the whole Atlantic Europe.

This kind of peaceful German extension is also favored by the central position of Germany in Europe, but it is very much based on the fact that Germany herself is not a country too much favored by nature, and it is her very poor soil which has educated her population to strong and intelligent labor. This population, however, increased to greater numbers than the ground could support, and this is the real cause of the expansion of German population by immigration, the influence of which has been so markedly felt by all Europe. It is the natural expansion of a strong, working forest-folk and one which resembles very much the expansion of the people on the east coast of North America over a whole continent.

The virgin forests of peninsular North America were far out of the reach of original American civilization, which could neither spread out over the shores of the American Mediterranean nor cross the arid regions and deserts north of Mexico. Their Indian inhabitants remained in the state of hunters and never cleared the woodland. The natural riches of that region were de-

veloped only when it was settled by Europeans, who had learned in Europe to overcome the resistance of forests to agriculture. And soon after its colonization, its population experienced that strong wish to expand which is so characteristic of early German migrations. The descendants of that population on the Atlantic slope of North America, who had cleared the virgin forests, crossed the Appalachian chain, cultivated the prairie grounds of the Mississippi basin, and adapted themselves to the arid climate of the west and the Italian climate of California. Thus the Atlantic side of North America plays in its colonization a rôle similar to that of Germany in the history of Europe.

The expansion of eastern North Americans, however, met with no strong resistance from the other inhabitants of North America. The Indians defended their ground in insufficient numbers and with insufficient arms, and they died out when they came into contact with higher civilization. In Europe, on the other hand, German emigrants spread amid peoples of larger numbers, and became, therefore, partly absorbed. The difference in expansion between the Atlantic North American and the German populations is neither caused by a greater strength of the North American expansion, nor by a lower education of German settlers; it is due to the fact that the North American expansion extended over a continent inhabited only by nomadic tribes of small numbers and of low civilization, while the German expansion extended over vast areas occupied by peoples with a culture and an organization of their own. This again is due to the fact that higher civilization spread out over all Europe, while the native civilization of North America remained restricted to the plateaus west of the Gulf of Mexico.

There is a remarkable resemblance between the expansion of German population

and that of America, and if we follow the latter to its sources we find that the early English settlers on the east coast are the descendants of German conquerors of England and their extension towards the west was followed and reinforced by a powerful wave of peaceful German immigrants, differing in language but similar in kind, and both waves formed one population in which the old German spirit of expansion is very active.

It is a curious chance that America received its name from a German geographer. Old Professor Waldseemueller made a mistake, indeed, when he named the new countries at Brazil after the Florentine Amerigo Vespucci. It would have been far more just to name the new world after Columbus, but though Waldseemueller recognized his mistake and withdrew the name, it remained in use. And curiously enough, that Amerigo Vespucci whose name gave origin to the name of America, had himself, though an Italian, still a German family name, Emmerich, Emery in English. Thus America is a continent with a German name, the meaning of which might, perhaps, be interpreted as "rich in corn";² if this is correct, Professor Waldseemueller chose an incorrect but appropriate name.

There are many connecting links between North America and Germany, but the strongest of these links is mutual friendship. True friendship needs no long words. I say to my friend, "Come, enter my house and feel at home"; and so I invite you to enter my home with me and to listen to my lectures on Germany.

ALBRECHT F. K. PENCK

REPORT OF THE COMMISSION ON AGRICULTURAL RESEARCH

THE Commission appointed by the Association of American Agricultural Colleges and Experiment Stations in 1906, to consider

² Amar, old German, a kind of wheat.

the organization and policy that should prevail in the expenditure of public funds for agricultural research, and kindred matters, has presented its report.

The members of the commission, David Starr Jordan, Stanford University, California, chairman; Whitman Howard Jordan, of Geneva, New York, secretary; Henry Prentiss Armsby, State College, Pennsylvania; Gifford Pinchot, Washington, D. C., and Carroll Davidson Wright, Clark College, Worcester, Massachusetts, agree in signing the report except that Mr. Pinchot makes some reservations. They summarize their recommendations as follows:

1. Every effort should be made to promote the training of competent investigators in agriculture both in the agricultural, and, so far as practicable, in the non-agricultural, colleges and universities, and their training should be as broad and severe as for any other field of research.

2. The progress of agricultural knowledge now demands that agricultural research agencies shall deal as largely as possible with fundamental problems, confining attention to such as can be adequately studied with the means available.

3. The work of research in agriculture should be differentiated as fully as practicable, both in the form of organization and in the relations of the individual investigator, from executive work, routine teaching, promotion and propaganda, and should be under the immediate direction of an executive trained in the methods of science who should not be hampered by other duties of an entirely unlike character.

4. The investigator should be free from all coercion whatever. In reaching his conclusions he should be equally free from the prescription of received opinion and the temptation to exploit his results for the purpose of obtaining future support. To this end, his work should be as far removed from immediate dependence upon legislation as is consistent with due responsibility to the public, and his relations to the public and to the organization of which he is a member should be such as to promote individual initiative and not interfere with freedom of conclusion or utterance on scientific questions.

5. There should be a clearer definition of the relative fields of work of the United States Department of Agriculture and the experiment stations. The dominance of the stations within their